



RTT TECHNOLOGY TOPIC
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Twenty Five Years in Telecom

On Monday October 13th 25 years ago the first phone call was made on the Ameritech cellular network in Chicago, Illinois, USA.

Over the next twenty five years the cellular industry went from zero revenue to become a multi trillion dollar global business.

The point of an anniversary is that it prompts us to look back in order to look forward.

This month we combine with our colleagues at **The Shosteck Group** and **The Mobile World** to share some observations on the past, present and future of the cellular radio business.

In particular we reflect on some of the lessons to be learnt from the successes and failures of the regulatory system.

There are many relevant parallels between telecom regulation and the regulation of global financial markets.

The regulatory environment in telecoms has been heavily influenced by governmental ambitions to maximise short term returns from spectral auctions.

The assumption is that longer term returns from licence fees and tax revenue can be assured by creating an openly competitive market.

Devices such as set aside and spectrum caps have been deployed to encourage new market entrants.

In the capitalist world there is a general assumption that competition is a necessary pre condition for maximising growth and profit.

However there comes a point where the artificial stimulation of competition has the unintended consequence of introducing insupportable industrial cost.

We suggest that this 'tipping point' has been reached in a number of cellular markets.

This implies a need to change present regulatory policy.

One can debate whether regulation should be a proactive or reactive process.

We would argue that it should be pro active but is generally reactive.

To be pro active, regulatory policy has to be based on certain assumptions on how

the political, business, market, technology and engineering environment will change.

Political change

25 five years ago Ronald Reagan was President of the US and Margaret Thatcher was British Prime Minister. There was a major terrorist attack in the Lebanon. The US invaded Grenada. Banks were over lending to Latin America and heading for a liquidity crisis.

Reagan and Thatcher were both influential in moving the deregulation agenda forward in parallel with a policy of breaking up established monopolies, AT and T and British Telecom being two examples.

Market principles were applied (with mixed success) to social and economic policy.

It might seem hazardous to project political change for the next twenty five years but certain underlying assumptions can be made.

Governments will continue to have a substantial self interest in ensuring that telecoms realises a sufficient return on investment to maintain future tax and spectral revenues.

This will not necessarily be achieved by light touch regulation and may require more rather than less political intervention.

Environmental obligations will become more onerous (and therefore expensive). Telecom entities will therefore have to find ways of transforming these obligations into political, social and economic value.

Public safety and security obligations will become more onerous (and therefore expensive). Telecom entities will therefore have to find ways of transforming these obligations into political, social and economic value.

The mechanisms for doing this are presently unclear. The failure by the FCC to realise the reserve auction price for the public safety spectrum at 700 MHz is a recent example of a mismatch between regulatory expectation and market sentiment.

Business

Twenty five years ago the Racal Electronics Board were criticised for 'risking' £25000 of shareholder funds on their 900 MHz TACS cellular license.

The appreciation of cellular spectral value over the past twenty five years has provided the basis for substantial capital asset growth in the industry (from nothing to several trillion dollars) and an excuse for some imaginative financing based on the perceived value of these assets.

Spectral value however directly translates into cellular spectral cost. Like other forms of physical property, a spectral asset can become a liability - a value/cost transform.

For example it is hard to reconcile present spectral costs with future cellular industry revenue expectations. This lack of sustainability in future cellular industry business

models is a cause for concern.

Vulnerability implies future business opportunity particularly for entities with access to spectrum acquired at lower cost.

Parts of the satellite industry for example are well positioned to exploit the substantial differential between original acquisition cost and present perceived spectral value and may use this advantage to create additional competition for cellular service providers.

This would suggest the need for a more proactive regulatory approach to managing the relationship between the cellular industry and other increasingly closely related industries including broadcasting, public safety and business radio.

Markets

The growth of the industry to date has been exhaustively documented and analysed and provides a robust starting point for forecasting future subscriber growth and revenue.

However the geographic and demographic distribution of revenue is as important as overall market growth when developing longer term regulatory frameworks.

In the early 1980's, the USA represented 70% of the world cellular market by volume and value.

By 2012 this share will have reduced to less than 7%. (Forecast from The Mobile World).

This geographic shift is having a profound impact on the global cellular competitive landscape and by default should be regarded as a dominant factor in developing long term regulatory policy.

Demographic shifts, an aging population being an example, can be similarly significant.

Technology

Technology is supposed to achieve multiple simultaneous objectives, cost reduction, performance improvement and better user functionality.

Component and production technology have been fundamental drivers of the cellular industry.

In 1983 it took eight hours to manufacture and test a cellular phone. RF testing (and device calibration) was particularly time consuming. RF tests today take less than a minute.

However cost reductions should sometimes be regarded as cost transforms. Costs do not necessarily disappear but re surface in other areas.

Handset software is one example. In 1983 a cellular phone had 10,000 lines of code. A GSM phone ten years later had 100,000 lines of code; a phone today has over one

million lines of code.

Phones today are typically shipped with several hundred software faults. The cost of this in terms of through life customer support and customer frustration cost is hard to quantify but real.

Similarly the shift to packet based networks was justified on the basis of step function delivery cost reduction.

In practice replacing centralised switch functionality with distributed soft switching just moves cost around. The hardware accelerators needed in a soft switch to emulate ATM and provide complex session support are at least as expensive as a centralised switch on a per subscriber session basis and introduce additional customer support cost -SLA management being an example.

Costs are therefore often higher than anticipated and/or anticipated cost savings fail to materialise. This is one of the most common causes of enforced industry consolidation.

Regulators would do well to reflect that a process of enforced consolidation is not always universally beneficial.

Engineering

Engineering is the ingredient needed to make technology work.

By implication the value of any technology is a function of engineering investment

Engineering investment decisions should be based on achieving a maximum rate of return per dollar spent.

Large established markets by value and volume therefore have a gravitational effect on engineering expenditure.

This obvious truth is too often ignored by regulators driven by a misguided mission to auction country specific or regionally specific frequency allocations.

Such allocations are sub scale and will fail to deliver sustainable economic value.

This is not a problem that is specific to small countries. The AWS band in the US, the 700 MHz cellular allocations in the US and the proposed 800 MHz band allocations in Europe are all sub scale and presently offer a minimal prospect of achieving a long term economic return. The lack of handsets (limited range availability and time to market delay) will effectively destroy potential growth in these orphan spectrum bands.

The point is that regulators are failing to take account of technology and engineering reality.

It could be argued of course that 'caveat emptor' applies and if cellular operators are prepared to bid for spectrum which has negative value then who should care.

We might question how and why operators take these decisions. The answer generally is that technology and engineering costs have not been fully factored in to bid valuations.

We would argue however that regulators do have a responsibility and self interest in ensuring that spectral assets are not over priced. The parallel with the present real estate melt down is particularly compelling.

An example of where competitive cost will exceed competitive value

So the thesis is that the artificial stimulation of competition may incur unsustainable industrial cost. This compromises overall market viability.

In July, France's antitrust body Conseil de la Concurrence (Arcep) released a study criticizing the level of competition in the French mobile phone market. The three mobile operators in the country are France Telecom, Bouygues and Vivendi/SFR. Arcep stated that a fourth 3G license would create "a positive dynamic" in the market.

This is an example of competition theory ignoring spectral cost.

Adding a fourth operator will result in substantial spectral inefficiency both to the new operator and for the other incumbents

The reasons for this are subtle but important.

The 3 G air interface works better with wider channel bandwidths (10 or 20 MHz rather than 5 MHz) and ideally each operator would have at least two channels and preferably three for frequency domain hand offs

The most spectrally efficient option would be for all operators to time share/time multiplex all the available frequency bandwidth but this would imply a complete change to the present auction mechanisms (and a high level of inter operator cooperation).

Two operators are less efficient than one, three are less efficient than two and four are less efficient than three.

This is particularly true for lower frequencies (900/850/800/700) but also applies to the 1.8 and 1.9 GHz band, 1.9/2.1 GHz band and 2.5 GHz extension band.

This suggests that the regulatory community is still dominated by economists who are choosing to ignore independent engineering advice.

If the engineering costs are factored in to this decision the 'positive dynamic' has a negative effect.

Summary

Past precedent suggests that introducing more competition increases market size and market value. This is a false assumption. The value created is often overstated once actual costs have been fully accounted.

Present precedent may suggest additional competition actively decreases market value and related social and economic value.

The reasons for this in the example above are specific to the way in which future LTE networks will be planned and deployed. This is why standard economic theory cannot and should not be applied to the 3G spectral allocation and auction process.

However the same caveat applies to most other band allocations.

The underlying issue is that spectral policy and spectral investment are often disconnected from engineering reality.

Spectral policy is closely coupled with the regulation of competition in our industry.

The artificial stimulation of competition through the regulatory process may have the unintended consequence of destroying spectral value.

This is particularly true in an economic environment where capital is constricted and risk is highly priced.

It could be argued that the competitive environment and regulatory environment are very different when compared to 25 years ago.

In practice not so much has changed.

The deconstruction of monopolies in the telecoms business could generally be regarded as a process which delivered quantifiable economic and social benefits.

The extension of that policy to encourage competition 'at any cost' is a far less convincing proposition.

In the cellular industry it may be that countries with effective duopolies, of which the US is a notable example, are best placed to maintain investment in a climate where cash is a scarce commodity.

Many cellular markets started life as duopolies - 25 years on we are back to where we started.

About RTT Technology Topics

RTT Technology Topics reflect areas of research that we are presently working on.

We aim to introduce new terminology and new ideas to clarify present and future technology and business issues.

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Contact RTT

[RTT](#), the [Shosteck Group](#) and [The Mobile World](#) are presently working on a number of research and forecasting projects in the cellular, two way radio, satellite and broadcasting industry.

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